

Enhanced Ocean Climate Products from NCEP

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Project Summary

Following successful experiments with new observational data sets in GODAS during FY06 and early FY07 these improvements have been either been made operational or are in the final stage prior to becoming operational. The use of altimetry data in GODAS became operational in March 2007. The operational GODAS exists in two forms, a standard version that lags the current date by 14 days and a second version that is initialized by the standard GODAS but is brought forward to lag the current date by 7 days. A 1-day lag version of GODAS is in final parallel testing and is expected to replace the 7-day lag version in operations in January 2008. A new deep version of GODAS, designed to make full use of the Argo data, is also in parallel testing and is also expected to become operational in January 2008. All these versions of GODAS are based on MOMv3. Work has also been completed on a new GODAS that is based on MOMv4. This GODAS will be part of the Coupled Forecast System Reanalysis and Reforecast (CFSRR) scheduled to begin in early 2008. It will also be the basis for future upgrades of the operational GODAS.

1.0 Progress in FY07

The work in FY07 focused on two areas. First, we have made upgrades to the operational GODAS based on our successful experiments with new observational data sets and, second, we have completed development of a new GODAS based on MOMv4 that will be part of the CFSRR and future upgrades of the operational GODAS.

1.1 Upgrades to the current operational GODAS

The assimilation of Jason-1 altimetry became part of the operational GODAS in March 2007. This upgrade to GODAS has been designed to be sufficiently robust to tolerate occasional dropouts of altimetry data and it has run successfully since its implementation.

The standard operational GODAS assimilates observations in a window extending from 2 weeks prior to 2 weeks after the analysis date, weighting observations closer to the analysis date more heavily. The purpose of this strategy is to increase the number of observations going into the analysis, but it means that the standard GODAS analysis lags the calendar date by 14 days. To satisfy a need for a more current analysis, both for monitoring changes in the ocean state and for initializing forecasts with the CFS, there is a second operational GODAS analysis with a 7-day lag that is initialized by the standard analysis and then runs forward for an additional week. We have extended this procedure further to create a 1-day lag analysis that is currently in its final parallel testing. When this 1-day lag GODAS analysis becomes operational in January, it will replace the 7-day lag analysis.

The standard GODAS assimilates observations only in the upper 750 meters which does not take full advantage of the deeper Argo profiles. So in FY06 we tested a modified GODAS that assimilates observations down to 2200 meters. We found that the deep assimilation eliminated a warm bias in the Indian and Pacific Oceans and a cold bias in the Atlantic Ocean that occurred below 800 meters in the standard GODAS. Following the success of these tests we decided to implement a deep GODAS. The deep GODAS is also in final parallel testing and will also become operational in January.

The standard GODAS is the source of initial conditions for seasonal forecasts with the CFS and thus any upgrades to that version must not alter the calibration of the CFS forecasts. The new deep GODAS will be free of that constraint and the goal is to maintain that version as the current state-of-the-art at NCEP. We have begun by using deep Argo temperature profiles and we will soon introduce Argo salinity profiles in place of the synthetic salinity developed for the standard GODAS.

The broad impacts of the altimetry and the Argo salinity data on GODAS are described in Behringer (2007) and the impact of the Argo salinity on the GODAS analysis in the Indian Ocean is discussed in Huang et al. (2007).

1.2 Development of a MOMv4 version of GODAS

We have completed the development of a new version of GODAS based on GFDL's MOMv4. The tri-polar grid of MOMv4 allows us for the first time to have a fully global system that includes an Arctic Ocean and an ice model. The 3DVAR assimilation code of the current operational GODAS was completely rewritten to take advantage of the FORTRAN 90/95 data structures and coding practices in MOMv4. The result is a more flexible system, more readily adaptable to using different data sets and computational methods.

The MOMv4 GODAS will be part of the new CFS Reanalysis and Reforecast (CFSRR) that will begin in January 2008.

References

Behringer, David W., 2007: The Global Ocean Data Assimilation System (GODAS) at NCEP. *Eleventh Symposium on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface, AMS 87th Annual Meeting, H.B. Gonzalez Convention Center, San Antonio, Texas, 12pp.* (a PDF version is available from http://ams.confex.com/ams/87ANNUAL/techprogram/programexpanded_393.htm)

Huang, Boyin, Yan Xue, and David W. Behringer, 2007. Impacts of Argo Salinity in NCEP Global Ocean Data Assimilation System: The Tropical Indian Ocean. (submitted to JGR)